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Validating the forgotten joint score-12 in patients after ACL reconstruction

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ABSTRACT

Background: The forgotten joint score-12 (FJS-12), used to measure postoperative joint awareness, has been extensively validated to assess outcomes after arthroplasty, however the new score has never been validated in evaluating anterior cruciate ligament (ACL) reconstruction. The purpose of our study was to validate the FJS-12 versus the knee injury and osteoarthritis outcome score (KOOS) for patients who have undergone ACL reconstruction.
Methods: All patients who had undergone ACL reconstruction with the same arthroscopic surgical technique at our institution between 2011 and 2014 (medium-term follow-up group (M-FU)) or between 2000 and 2005 (long-term follow-up group (L-FU)) were considered for inclusion in the study. To analyze unidimensionality of the FJS-12, we calculated Cronbach's alpha, item-total correlations and conducted an exploratory principal component factor analysis. To assess convergent validity, we calculated Spearman correlation coefficients for the FJS-12 and its comparable scales.
Results: We analyzed 58 patients of the M-FU (mean follow-up 31.5 (SD13.4) months, range 12–54), and 58 patients of the L-FU (mean follow-up 139 (SD15.2) months, range 120–179). The FJS-12 showed high internal consistency (Cronbach's alpha = 0.95). Ceiling effects were considerably lower for the FJS-12 (M-FU 12.1%, L-FU 15.5%) compared with the KOOS subscales (M-FU 5.2–37.9%; L-FU 13.8–55.2%) and WOMAC subscales (M-FU 37.9–62.1%; L-FU 44.8–60.3%).
Conclusions: The FJS-12 is a valid measurement tool to evaluate outcomes of ACL reconstruction. This study extends the possibilities of measuring joint awareness as a patient-reported outcome parameter from joint arthroplasty to ACL reconstruction.

1. Introduction

The goal of anterior cruciate ligament (ACL) reconstruction is to rebuild the ligament as closely as possible to the native anatomy in order to restore pre-injury knee function and a 'normal' feeling in the affected knee. Recently, 'individualized surgery' which respects the variation in insertion sites, size of the graft, tunnel angles and graft tension has been proposed [1]. Remnant-preserving procedures are recommended because of several theoretical advantages such as anatomic positioning, better proprioceptive function and better graft healing compared to conventional ACL reconstruction [2]. However, the success and perceived patient benefit of such new treatment procedures have to be assessable with reliable and valid instruments which are able to measure even small changes and improvements in surgical outcome. As ACL reconstruction has evolved and patient outcome has improved over the last decades, several established patient-reported outcome (PRO) measures have shown limited

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discriminatory abilities because of a ceiling effect [3–6]. These measures may not be able to capture subtle differences in patient outcomes between different surgical techniques, different patient groups and subsequent potential variations in perceived function.

In 2012 a new PRO concept, the measurement of joint awareness with the forgotten joint score-12 (FJS-12), was introduced [7]. This questionnaire focuses on patients' awareness of a specific joint during activities of everyday life. Generally, joint awareness has a negative connotation as people with healthy, well-functioning joints are not aware of them in daily life, they can therefore be regarded as 'forgotten'. Taking the lack of awareness (forgotten joint) of the normal healthy joint as a benchmark for postoperative evaluation, the ultimate goal of ACL reconstruction is to achieve forgetting the knee joint, a goal that is certainly hard to attain, and therefore constitutes a discerning measure.

Until now the FJS-12 has been validated to evaluate the outcome of knee and hip arthroplasty and has been shown to have a low ceiling effect and to discriminate well between good, very good and excellent outcomes in arthroplasty populations [6–16]. However, this relatively new score has never been validated to evaluate outcomes of reconstructive knee surgery. As ACL surgery is performed in a more active and younger patient group compared to joint arthroplasty, the FJS-12 may be a very suitable measure to capture PROs. Therefore, the objective of this study was to validate the FJS-12 versus the knee injury and osteoarthritis outcome score (KOOS) in a patient sample after ACL reconstruction.

2. Methods

2.1. Patients

All patients that had undergone ACL reconstruction at our institution between January 2011 and September 2014 and between August 2000 and December 2005 were considered for enrollment in the study. Inclusion criteria were as follows: (1) minimum follow-up one year (medium-term follow-up group (M-FU)), or 10 years (long-term follow-up group (L-FU)); (2) unilateral ACL rupture; (3) primary ACL reconstruction with hamstrings, femoral fixation with Rigid-Fix® (DePuy Mitek, Inc.); (4) proficiency in the German language; (5) written informed consent.

2.2. Surgical technique

After harvesting the hamstring grafts, the tendons were prepared according to the Rigid-Fix® (DePuy Mitek, Inc.) surgical technique. The tibial tunnel position was determined using a drill guide (Arthrex®). The tibial tunnel was drilled with a cannulated drill over a guide wire. Next, the femoral tunnel was positioned using a femoral drill guide (Arthrex®). With the knee in flexion, the offset drill guide was placed in the 'over the top' position and the guide wire for a cannulated drill was put in place for the femoral tunnel. Having reamed the femoral tunnel, the graft was inserted and fixed. On the femoral side the graft was stabilized with two resorbable PLA pins (Rigid-Fix®, DePuy Mitek, Inc.), inserted using the cross-pin technique. Tibial fixation was achieved either with a bioabsorbable interference screw (Milagro®, DePuy Mitek Inc.) or resorbable Polylactic acid pins (Rigid-Fix®, DePuy Mitek, Inc.) with the same cross-pin technique as on the femoral side. All patients were prescribed early functional rehabilitation with loading within pain threshold after four weeks of partial weight bearing (20 kg), without a brace.

Sociodemographic and clinical data including sex, age, technique of ACL reconstruction, and time since surgery were collected. Patients received the questionnaires (FJS-12 and KOOS) and an informed consent form via mail. A reminder call was made to those patients who did not return the questionnaire within eight weeks. If there was no response for another four weeks, they were excluded. Reasons for not participating in the study were recorded. PROs were evaluated using the FJS-12 and the KOOS. Ethical approval for this study was obtained by the local ethics committee (ref. no. EKSG 15/159).

2.3. FJS-12

The FJS-12 consists of 12 questions with a five-point Likert response format. Raw sum scores are transformed to a 0- to 100-point scale with high scores indicating good outcomes, i.e. a high degree of forgetting the joint in everyday life (forgotten joint phenomenon). In the initial validation study, the FJS-12 showed high internal consistency (Cronbach's alpha = 0.95) and discriminated well in well-known group comparisons [7]. Meanwhile the measurement properties of FJS-12 have been evaluated and confirmed in different arthroplasty populations in a number of studies [6–16].

2.4. KOOS

The KOOS seemed most appropriate for evaluation of the construct validity of FJS-12 because it is widely and increasingly used [17], well validated for ACL reconstruction [18–20] and was designed to evaluate both knee injuries and osteoarthritis in an attempt to assess the patients throughout their lifetime.

The KOOS has 42 items that assess five outcomes in subscales: pain, symptoms, activities of daily living (ADL), sport or recreation function (sport), and knee-related quality of life (QOL). The KOOS scale ranges from 0 to 100, with the latter being the highest possible result — high scores indicating less pain and disability [21].

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